

Missouri Educator Gateway Assessments

FIELD 012: MIDDLE SCHOOL EDUCATION: MATHEMATICS TEST FRAMEWORK

January 2014

DRAFT

Content Domain	Range of Competencies	Approximate Percentage of Test Score
I. Number and Operations	0001–0002	19%
II. Algebra and Functions	0003–0006	36%
III. Measurement and Geometry	0007–0009	27%
IV. Statistics and Probability	0010–0011	18%

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TEST FRAMEWORK
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*A scientific calculator will be available to examinees taking
the Middle School Education: Mathematics test.*

NUMBER AND OPERATIONS

0001 Understand numbers.

For example:

- 1.1 Analyze the relationships between the subsets of the real numbers.
- 1.2 Understand the role of place value in any number system.
- 1.3 Analyze the use of estimation in a variety of situations.
- 1.4 Translate between different representations of numbers.
- 1.5 Apply number-theory concepts (e.g., divisibility rules, prime factorization, greatest common factors) in problem-solving situations.

0002 Understand operations.

For example:

- 2.1 Analyze relational and operational properties (e.g., multiplication and division of fractions).
- 2.2 Analyze a variety of conventional and alternative algorithms.
- 2.3 Solve a variety of real-life and mathematical problems involving integers, fractions, and decimals, including exponents.
- 2.4 Solve a variety of real-life and mathematical problems involving ratios, proportions, unit rates, and percents.

ALGEBRA AND FUNCTIONS

0003 Understand patterns, relations, and functions.

For example:

- 3.1 Analyze patterns and relationships.
- 3.2 Analyze the properties of relations and functions in multiple representations (e.g., tables, graphs, equations, words).
- 3.3 Analyze direct and inverse proportional relationships.
- 3.4 Determine the effects of transformations on the graph of a function or relation.

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0004 Understand algebraic techniques and applications.

For example:

- 4.1 Manipulate algebraic expressions, equations, and inequalities (e.g., simplify, transform, factor).
- 4.2 Solve linear and nonlinear equations and inequalities.
- 4.3 Create algebraic expressions or equations that describe numbers or relationships.

0005 Understand linear relations and applications.

For example:

- 5.1 Analyze the relationship between a linear equation or inequality and its representations.
- 5.2 Solve systems of linear inequalities or equations with a variety of methods.
- 5.3 Interpret the meaning of the slope and the y-intercept in various contexts.
- 5.4 Analyze a variety of real-life and mathematical problems involving linear equations, systems, and inequalities.

0006 Understand nonlinear relations and concepts of calculus.

For example:

- 6.1 Analyze relationships between multiple representations of a nonlinear equation (e.g., quadratic, polynomial, exponential) or inequality.
- 6.2 Solve a variety of real-life and mathematical problems involving nonlinear equations and inequalities.
- 6.3 Demonstrate knowledge of the concepts of limit, continuity, and rate of change as they relate to function behavior.
- 6.4 Demonstrate knowledge of sequences and series and of recursive definitions.
- 6.5 Demonstrate knowledge of how concepts of calculus can be used to solve problems in real-life situations.

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MEASUREMENT AND GEOMETRY

0007 Understand measurement principles, procedures, and applications.

For example:

- 7.1 Reason quantitatively and use units and unit conversions to solve problems.
- 7.2 Calculate or estimate measures of lengths, areas, and volumes.
- 7.3 Apply the concepts of similarity, scale factors, and proportional reasoning to solve indirect measurement problems.
- 7.4 Analyze precision, accuracy, and rounding in measurements and computed quantities.

0008 Understand Euclidean geometry in two and three dimensions.

For example:

- 8.1 Analyze properties of points, lines, planes, and angles.
- 8.2 Use the properties of triangles, quadrilaterals, and other polygons and circles to solve problems.
- 8.3 Apply principles of similarity and congruence.
- 8.4 Understand and apply the Pythagorean theorem and its converse.
- 8.5 Visualize relationships between two-dimensional and three-dimensional figures.
- 8.6 Analyze geometric arguments using deductive reasoning.

0009 Understand coordinate and transformational geometry.

For example:

- 9.1 Analyze two- and three-dimensional figures using coordinate systems.
- 9.2 Connect algebra and geometry by applying concepts of distance, midpoint, and slope to classify figures and solve problems in the coordinate plane.
- 9.3 Analyze transformations of figures in the coordinate plane.
- 9.4 Analyze figures in terms of symmetry and tessellations of the plane.

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STATISTICS AND PROBABILITY

0010 Understand principles and techniques of statistics.

For example:

- 10.1 Analyze the effects of bias and sampling techniques.
- 10.2 Use appropriate formats for organizing and displaying data.
- 10.3 Analyze univariate and bivariate data in a variety of representations.
- 10.4 Make inferences and justify conclusions from data presented in a variety of representations.
- 10.5 Analyze the use of measures of central tendency and spread.

0011 Understand principles of probability and techniques for determining probability.

For example:

- 11.1 Determine probabilities of simple and compound events.
- 11.2 Use counting principles (e.g., permutations, combinations) to calculate probabilities and solve problems.
- 11.3 Use a variety of visual representations to calculate probabilities.
- 11.4 Demonstrate knowledge of methods for simulating probabilities.